

**DRAWPIC**

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The book cover features a light blue background with a repeating pattern of the word 'Artwork' in a bold, white, sans-serif font. Each letter is outlined in a thick red border, creating a high-contrast, graphic effect. The text is slanted diagonally across the cover. In the center, there is a white rectangular label with rounded corners. On this label, the word 'DRAWPIC' is printed in a black, bold, sans-serif font.

**DRAWPIC**



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The logo for Artworx, featuring the word "Artworx" in a stylized, bold, red font with a white outline. The letters are thick and blocky, with a slight shadow effect.

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## DRAWPIC

written by Dennis Zander  
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### INTRODUCTION

DRAWPIC allows the user to create detailed and colorful graphic images which can be easily incorporated into your own programs. After you create an image using the various options of DRAWPIC, a machine language routine will save the bytes which represent the image and store them as part of the program in an ASCII string subroutine (image string). This subroutine can then be called at a later time and another machine language routine instantly will put the image onto the screen at a point selected with the joystick controlled cursor. Smaller images can be added together to make larger ones, and size can be changed by using a different compatible graphics mode (4 & 6 are compatible - 3,5,7 are compatible). When you are finished, the program and all the images are saved by simply pressing 'Q' for Quit. The image strings and machine language routines can then be used in your own program for some potentially spectacular results.

### GETTING STARTED

Plug your joystick into slot #1 and load the program. (DRAWPIC requires the BASIC cartridge). After the program displays the title page, let the program set for a minute and you will see a demonstration of how rapidly images can be put onto the screen. Now go ahead and press any key to start the actual program. You will be in drawing mode with Graphics 3 and a text window that shows you the Graphics Mode, Color, Mode (plot or draw), free memory in BYTES, and your X,Y coordinates for that Graphics Mode. Your cursor is a little flashing dot in the upper lefthand corner (it starts at X=1,Y=1). The position of this cursor is changed by moving the joystick. Plot or draw functions are activated by using the trigger button. In PLOT mode, press 'P'; each time that the trigger is pressed, a single point is plotted on the screen. If you hold the trigger down and move the cursor around you will be able to draw freehand.

In DRAW mode, press 'D'; place the cursor and press the trigger to fix a start point and then move the cursor and press the trigger a second time; a line will then be drawn from the start point to the finish. Now try rubber band mode, press 'R'; the first time that you press the trigger you will nail down one end of a rubber band line whose color is set by the color register you are using (keys 0-3 select color registers). By moving the cursor you will see that a line is drawn and repeatedly updated to stay between the start point and the cursor. Also note that if the line crosses something previously drawn, it will erase it, so be careful. Now try the rubber band fill. If you haven't done so already, press the trigger so that you leave your line and can move just the cursor around. Press down the trigger and hold it down, then move the cursor in the increasing X direction then the increasing Y

direction. You will immediately see why this is called rubber band fill (or erase if you select color register 0, the background). If you release the trigger you are in plain rubber band mode and then pressing the trigger again will free the cursor.

When drawing in graphic modes 3, 5 or 7, you can use any of three colors simply by pressing the keys '1', '2' or '3'. The fourth color, color 0, is actually background and is used for "erasing." Orange, green and blue are the default colors of the '1', '2' and '3' keys respectively. Use these keys as you would a paint bucket for changing colors. You may change the color of "paint" which you are using, but you will also change the "paint" already present on the screen. These colors are actually set by the values stored in a color register.

To change the hue and luminance of a color register, as SETCOLOR does in BASIC, press 'C' and then select the color register to be changed. You can create a color by using the joystick and following the directions indicated on the screen. Pressing the trigger stores the color information (although it's not permanently stored until the image is stored) and returns you to the drawing mode.

Since we have brought up the topic of storing images, let's store one of your own.

Press 'S', now move the cursor to the upper-left corner of the area to be stored and press the trigger; then move the cursor to the lower-right corner of the area to be stored. When you press the trigger, the bytes included in the rectangle just specified will be written to a string and saved with the program. You will be required to specify an image number and to give the image a name; this permits easier extraction of the image later.

You can view all stored images by pressing 'V' followed by the image number which you want to start with. This will clear the screen and then display each stored image until any key is pressed. Note an image and its identifying number and then press 'L'; this loads an image. After you type in the image number, answer whether or not you want the screen cleared of existing images. If you do not erase, then the loaded image will be drawn in the current graphics mode regardless of the mode in which the image was originally drawn. Position the cursor where you would like the upper left hand corner of the image. Each time you press the trigger, the image will be put on the screen. To exit image loading just press any key and you will return to normal drawing mode.

We've talked a lot about creating, now let's discuss erasing. To get a clean screen, you can do a shift-CLEAR; to erase just a point or line you can use the appropriate draw mode with color register 0 (background). Stored images can be deleted by pressing shift-DELETE. Once you specify a starting image, it and all subsequent images will be deleted.

**IMPORTANT!** So far everything has been done with information stored in the computer. To have images permanently stored on cassette or disk, you must press 'Q' for quit in order to save the program and all new images to disk.

The instructions are summarized in Appendix 1.



## IMAGES IN YOUR PROGRAM

The program listing in Appendix 2 shows the code necessary to make use of your created images. Lines 10-16 set things up. Line 16 sets colors after getting them from the subroutine call in line 14. Lines 5100-5199 may be listed to cassette or disk directly from DRAWPIC.

The subroutine at 5100 must be called after setting the graphics mode since line 5100 calculates the start of screen data (DAT) which will be different for different graphics modes. Line 5110 calculates the address that the first byte of an image will be put based on the X,Y position specified. Constants LC and PX are evaluated in line 11 but must be set as indicated in the REMs of Appendix 2. Line 5108 is the machine language subroutine for putting images in screen memory per the call in the subroutine at 5199:

```
A = USR(PICT,STRT,ADR(D$),BYT,LIN,LC)
PICT = Address of machine language subroutine
STRT = Starting address of image
ADR(D$) = Address of data for image
BYT = Image width in bytes
LIN = Image length in lines
LC = # bytes per line in this graphics mode
```

Lines starting at 20,000 are your image(s). They can be LISTed out of DRAWPIC and ENTERed into your program. If your image lines can easily be listed to the screen with room to spare (after you press 'Q' for a permanent save), then you can load your program with CLOAD or LOAD "D:PROGRAM" then move the cursor to the first line of image data and press return for each line of the image to add it to your program. If your image is too big for this, then you will have to 'LIST' the lines to cassette or disk and 'ENTER' them after loading your program.

For example, if your image is stored in lines 20100 to 20115, then type: LIST "D:IMAGE.LST",20100,20115. This will create a disk file containing your image. If you have a cassette recorder, then insert a data tape and type: LIST"C:",20100,20115. This will store the image onto tape. To enter the image into your own program, type: ENTER"D:IMAGE.LST" from disk, or rewind your data tape and: ENTER"C:" from cassette. Make sure that you include all of the lines for your image including the one with the REM and image name.

## ADDITIONAL USEFUL INFORMATION

In order to minimize the number of bytes required to store images, only the bytes necessary are stored as indicated by the start and stop points you set when doing a STORE. Now each byte in Modes 3,5, and 7 stores 4 graphics points (pixels) with 2 bits per pixel. This is why you can have four colors in these modes, counting the background of course. In graphics modes 4 and 6 there are 8 pixels per byte and only color 1 or background!

Therefore, mode 7 has 40 bytes for 160 pixels per line and mode 6 has 20 bytes for 160 pixels per line, (LC = 40 and LC = 20 respectively), and PX = 4 pixels per byte for graphics mode 7, and PX = 8 pixels per byte for graphics mode 6. These proportions hold for the other modes as well. This means that for graphics mode 7, the pixels at X = 0-3 are in byte 1 and X coordinates 4-7 are in byte 2:

PIXEL, X =	0	1	2	3	4	5	6	7
BITS	00	01	01	10	10	00	11	11
COLOR REG	0	1	1	2	2	0	3	3
BYTE #	1				2			

In order to get images to butt together without any gaps, it is necessary to start at the beginning of a byte (any multiple of 4 for odd # modes and 8 for even # modes) and to finish at the end of a byte (a multiple of 4 or 8 minus 1). For instance, X = 8 to X = 31 will be exactly 3 bytes wide.

This brings up an important tidbit. As you can see in line 20201 of the listing in Appendix 2, the graphics mode that the image was drawn in is stored GR = 3, however, when it was displayed it was done in graphics 7, see line 11. Does that give you any ideas?

#### APPENDIX 1.

##### Instructions:

G - GRAPHICS MODE, Selects from graphics modes 3-7.

D - DRAW LINE, Draws a line between two selected points.

R - RUBBER BAND FILL, Draws a line continuously from a start point to the current cursor position and leaves all lines on the screen if trigger is held down.

P - POINT PLOT, A point is plotted on the screen each time that the trigger button is pressed.

C - COLOR SET, The hue and luminescence of the selected color register are set using the joystick. Mode is terminated when any key is pressed.

S - STORE PICTURE, Use to store entire screen or partial images. Set start point in upper-left corner and end point in lower-right corner. Image is saved as a string array. Line number starts at:

$$20000 + N * 100$$

where N is the image number. (N = 2, Line = 20200)

L - LOAD PICTURE, After image number is specified, the image can be placed on the screen as many times as desired at the cursor location each time the trigger is pressed.



V - VIEW STORED PICTURES, Clears screen and puts stored images on screen one at a time starting at the number input until the last picture or until a key is pressed. (Good for finding an image).

0 - 3, Selects color register, pick the color to draw with; color 0 is background and is used for erasing.

shift CLEAR, Clear screen.

shift DELETE, Delete stored pictures, all images starting at the one indicated are erased from memory.

Q - QUIT, Saves the current program and all images to disk or cassette. (This is the only permanent storage).

## APPENDIX 2.

```
0 REM **DRAWPIC DEMO** (C)1982 ARTWORK
1 REM by Dennis Zander
2 REM FOR YOUR OWN PROGRAM YOU ONLY
3 REM NEEDED LINES 10-5199 AND YOUR
4 REM STRING ARRAY IMAGES (LIKE 20200-20201).
5 REM THE GOSUB IN LINE 14 MUST HAVE THE SAME LINE #
6 REM AS YOUR DATA SUBR. ADJ. AS NEEDED:
7 REM FOR GR.3 LC=10 PX=4; GR.4 LC=10 PX=8; GR.5 LC=20 PX=4
8 REM & GR.6 LC=20 PX=8; GR.7 LC=40 PX=4
9 DIM D$(100),C(4)
10 GRAPHICS 7:PX=4:LC=40:X=72:Y=32
11 GOSUB 5100:REM TO FIND SCREEN,ETC.
12 GOSUB 20200:REM OR YOUR SUBR LINE#
13 FOR I=0 TO 4:POKE 708+I,C(I):NEXT I:REM SET PER STORED COLORS
14 GOSUB 5199:REM DRAW (1) PICTURE!
15 GOTO 30000:REM YOUR PROGRAM HERE.
5100 DL=PEEK(560)+PEEK(561)*256:MEM=PEEK(106)*256:DAT=PEEK(DL+4)+256*PEEK(DL+5)
5108 PICT=ADR("hhhhhhhhhhhe"):REM !!!ENTER LINE 5108 OF DRAPIC!!!
5110 STRT=DAT+Y*LC+INT(X/PX):RETURN
5199 GOSUB 5110:A=USR(PICT,STRT,ADR(D$),BYT,LIN,LC):RETURN
20200 D$="P_@P@_X":REM SEE BELOW
20201 REM D$="ctrl<"; ctrl<U> P ctrl<v> ctrl<A> shift<-> inv<U> ctrl<r> ctrl<E> inv<v> inv<r> @ ctrl<V>
20202 REM inv-shift<=> esc-ctrl<del> P Z inv-shift<=> esc-ctrl<del> inv-ctrl<T> ctrl<V> inv-shift<=> esc-ctrl<del>
20203 REM P ctrl<E> inv<v> inv<Z> @ ctrl<A> shift<-> inv<Y> 2-ctrl<r> ctrl<U> X 7-ctrl<r> ctrl<Q> ctrl<r>X*
20204 BYT=4:LIN=11:GR=3:C(0)=246:C(1)=62:C(2)=148:C(3)=70:C(4)=192:RETURN
30000 ?
30020 TRAP 30030:?"":X;" NEW X "":INPUT X:IF X>179-BYT THEN ? "TOO BIG!!!"GOTO 20
30030 TRAP 30040:?"":Y;" NEW Y "":INPUT Y:IF Y>79-LIN THEN ? "TOO BIG!!!"GOTO 30
30040 TRAP 30050:N=1?"HOW MANY?":INPUT N
30050 FOR J=1 TO N
30060 GOSUB 5199:REM PUT PICT. ON SCREEN
30070 FOR I=20 TO 0 STEP -1:SOUND 0,0,2,I:NEXT I:REM MAKE A NICE SOUND!
30080 X=X+4:BYT:NEXT J
30090 ? "":GOTO 30020:REM DO IT AGAIN?
```

DRAWPIC

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No. \_\_\_\_\_

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ERASE.  
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